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Commercial Strawberry Growing in Kentucky

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Commercial Strawberry Growing in Kentucky

By W. W. MAGILL

Kentucky is well situated geographically for commercial strawberry growing. The ripening season follows that of Tennessee, Arkansas and North Carolina and coincides with that of southern Illinois. Strawberries have been a major crop in parts of the state for more than 30 years. Commercial production during this time ranged from 500 to 1,330 carloads annually, worth, on the average, more than a million dollars.* Improved transportation by refrigerated express, and precooling the berries in the cars at the loading point, make it possible to deliver Kentucky berries in perfect condition to distant markets in New England and Canada. Kentucky Aromas sell at a premium over berries from other states.

An incentive to raising strawberries commercially is that they are well adapted to small farms where intensive farming is desirable; that they add cash to the farm income in May and June when few other crops are ready for sale; that the labor requirement, altho urgent at times, does not seriously conflict with that for tobacco and corn; and that strawberries may be grown profitably on some farms which cannot produce tobacco to advantage. The importance of the strawberry industry to Kentucky is further illustrated by the fact that during berry harvest, profitable employment is furnished to over 50,000 persons as pickers and truck drivers.

DEFINITE MARKETING PLANS ADVISABLE

Strawberries are so perishable that they must be sold or placed in transit within a few hours after picking; therefore, if a commercial planting of a few hundred acres is to succeed in any community, adequate marketing facilities are necessary. A number of successful cooperative marketing associations for strawberries are already in operation in Kentucky. Such an association is controlled by a Board of Directors, chosen from among the berry growers. The Board employs a competent sales manager whose duty it is to sell all the berries, in a daily or weekly pool. Any new growers within trucking distance of these established marketing groups are wel-

* The 1929 census showed 6,557 acres of commercial berries in Kentucky which produced 8,972,024 quarts, or 838 carloads, and in 1934, 10,451 acres which produced 12,399,918 quarts, or 1,154 carloads.

come to become members by growing and packing the standard varieties handled by their nearest berry cooperative. Standard uniform berry crates are sold by the association to members at cost.

Many acres of berries are grown for marketing locally, often direct to the consumer, by the quart, gallon or crate; nevertheless, many local markets are not yet being supplied with home-grown berries. This offers the opportunity for local expansion of the industry.

A LIMITING FACTOR

The dread of picking is probably the outstanding obstacle that confronts the farm family considering planting one or more acres in any section where berries have never been grown except for home use. Many families have never raised farm crops which required the use of hired labor and have always depended on the family to do all the work. We frequently hear such comments as "too hard a job to pick strawberries" or, "no local labor supply available for picking." A survey of several hundred growers who have raised strawberries for a period of years shows that most of them depend entirely on hired help, either local or transient, to do the picking. Where the wife or children of the grower help to pick, it is customary to pay them in cash each Saturday the same as other pickers. There are few cases on record during the past ten years where strawberries have decayed in the field because pickers were not available. It may be necessary for the individual grower to send a truck to a nearby town, for pickers, or to run a want advertisement in the local newspaper ten days in advance of the picking season. For example: "Wanted – 20 strawberry pickers about May 15. Good wages."

SOIL AND FERTILIZER

Strawberries succeed on many types of soil. Good tobacco land that is not subject to floods usually is preferred. It has been noted that strawberries grow better on new land than on old, unless a program of soil improvement has been followed. The expense of improving the soil for growing strawberries is more than justified because few crops return a higher income per acre. The cost of planting, cultivating, hoeing and mulching an acre of strawberries is about the same whether the yield is 50 crates or 200 crates. Yet at $3.00 per crate gross selling price, allowing $1.25 per crate for expense of picking and marketing, the net return on a 200-crate yield would be $262.50 per acre more than on a yield of 50 crates.

The chief factors that limit the productiveness of many Kentucky soils seem to be nitrogen, phosphorus and moisture supply. Except in much of the Bluegrass area, most soils in Kentucky are

low in phosphorus content. On such soils the use of 400 pounds of 20-percent superphosphate has helped to give good yields of berries. In some localities in western Kentucky 500 pounds of 4-12-4 fertilizer gave excellent results. Either fertilizer may be applied just before planting but it is preferable to use it on a green manure crop just preceding the strawberries, to assure a good volume of vegetable matter to turn under. Legume crops, such as cowpeas, soybeans, lespedeza and sweet clover, are particularly good as green

FIG. 1. SOYBEANS FOR GREEN MANURE. A soybean crop being turned under as green manure. The plants were just beginning to blossom. Strawberries were planted on this land the following March. This soil treatment not only supplies abundance of a balanced plant food for berries, but also greatly increases the moisture-holding capacity of the soil. Demonstration tests have shown an increase of more than 50 crates per acre from this practice.

manure for this purpose because they rot quickly to form a desirable kind of organic matter, and also add nitrogen to the soil. The presence of an abundance of organic matter is particularly important because it greatly increases the water holding capacity of the soil and the crop is not so likely to suffer for water during a dry harvest season.

In experiments in Tennessee and Ohio, 100 pounds of nitrate of soda or sulfate of ammonia, per acre, side-dressed on the plants in August, increased the yield 20 to 50 crates per acre. The use of nitrogen fertilizer in August stimulates the formation of fruit buds, most of which are produced in the fall. Application in the spring of the year in which the crop is to be harvested is not recommended

since this is too late to influence the formation of fruit buds, and nitrogen fertilizer applied at that time seems to cause the production of soft berries.

Strawberries seem to thrive best in a slightly acid soil; that is, about pH 6. Lime may be needed on very acid soil and on average soil, to get a good growth of legumes for a green-manure crop, but a large amount of lime should not be used without first determining the need for it. Usually, one ton of ground limestone per acre is sufficient.

VARIETIES

The Aroma is the outstanding commercial variety in Kentucky. Over 90 percent of the strawberry acreage is of this variety. Kentucky Aromas top the terminal markets of the north during their season. The runners make enough plants, under normal conditions, when planted early, to develop a good matted row; the foliage is resistant to the leaf-spot disease. With favorable weather, the plants produce large berries of attractive color, with attractive, dark green calyxes, or caps. The berries have excellent carrying qualities, when shipped either by truck or carload, and hold their color after they are taken from a refrigerator car. The Aroma does not produce well in the Bluegrass region of Kentucky.

The Blakemore is the second best commercial berry of Kentucky. It ripens about a week earlier than Aroma and has excellent shipping qualities. It is especially good for use in ice cream, and has high rating as a preserving berry because it holds its color and shape. Disadvantages are that it makes too many runner plants; its flowers are often killed by frost, and after the first few pickings it tends to produce small berries. The Blakemore is susceptible to the leaf spot disease.

Premier is the outstanding berry for the Bluegrass area of Kentucky, where it yields exceptionally well. For local sales and a truck market up to 150 miles distant, the Premier is in great demand. The berry is of excellent quality for preserving and use in ice cream manufacturing. Disadvantages are that it often fails to make sufficient runners for a perfect matted row, and, when shipped under refrigeration, the color fades, and the berries do not hold up well after being taken from an iced car.

The Dorset and Fairfax varieties are highly advertised and recommended in many parts of the United States. However, many of the plantings under observation in Kentucky were a disappointment. In comparative tests at the Kentucky Experiment Station, for the past three years, these varieties produced less than two-thirds the yield of Premier or Blakemore. They deserve further

testing in other parts of the state. The everbearing varieties have not been a success in Kentucky, in trial plantings.

IMPORTANCE OF EARLY PLANTING

March or early April is the desirable time to plant strawberries in Kentucky. Plants set in late fall or early winter are likely to be forced out of the soil by alternate freezing and thawing. Plants set after April 10 are usually slow in starting growth and therefore runner formation is delayed. Maximum yield of berries the season after planting is produced where the runners have developed early. In Ohio* a comparison was made of the yield from runner plants (the Premier variety) rooted at different times during the season previous to fruiting. The yield from plants rooted in June was 4 times as great as from those rooted in August and 15 times as great as from those rooted after October 1st.

SELECTION OF PLANTS

Experienced berry growers usually take plants from their one-year-old patches for starting new plantings, using only sturdy young plants which have light-colored roots and a strong crown. Old plants have corky, dark-colored roots and a thick crown and are less desirable for planting. Often sufficient plants can be dug from the space between the rows or from edges of the matted row without disturbing the main part of the fruiting row. It is highly desirable to dig the plants in February or early March and heel them in on clean soil some distance from the old berry fields. This procedure is especially valuable in avoiding crown borer which is the most destructive insect known to commercial strawberry growers.

If the plants are purchased from a nursery it is especially desirable that they be ordered well in advance of planting time. Nurseries in the northern states are greatly handicapped in delivering plants in Kentucky in time for early spring setting.

As soon as the plants arrive they should be unpacked and planted; but if the field is not ready, they should be heeled in at once. If allowed to remain in the original package the plants are likely to heat and to be seriously injured. For heeling in, select well-drained soil. Dig a V-shaped trench about 6 inches deep, cut open the bundles and spread out the plants singly in the trench, then fill in with moist, loose soil so that it comes in contact with all roots. It may be desirable to water the plants well after they are heeled in.

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* Ohio Experiment Station Bulletin 444, The Strawberry in Ohio. J. G. Shoemaker.

PLANTING DISTANCE

Commercial strawberries in Kentucky are grown almost exclusively on the matted-row system. To establish this system the rows should be 4 feet apart with the plants 18 to 36 inches apart in the row. Aroma and Blakemore varieties are usually set 4 x 3 feet which requires approximately 4,000 plants per acre, with sufficient plants left for replacing those that die. The Premier variety should be planted 4 x 2 feet, as they make fewer runners.

PREPARATION OF THE LAND

The land should be broken preferably in late fall or not later than early spring and thoroly worked down. Level or poorly drained soil produces finer berries if the soil is listed or ridged. These ridges are made with the break plow and allowed to remain until time to set plants, when the top of the ridge is leveled with the drag. This gives a firm soil in which to set the plants. Hillsides that are so sloping as to be subject to erosion can be made fit for strawberries by terracing (see Fig. 2).

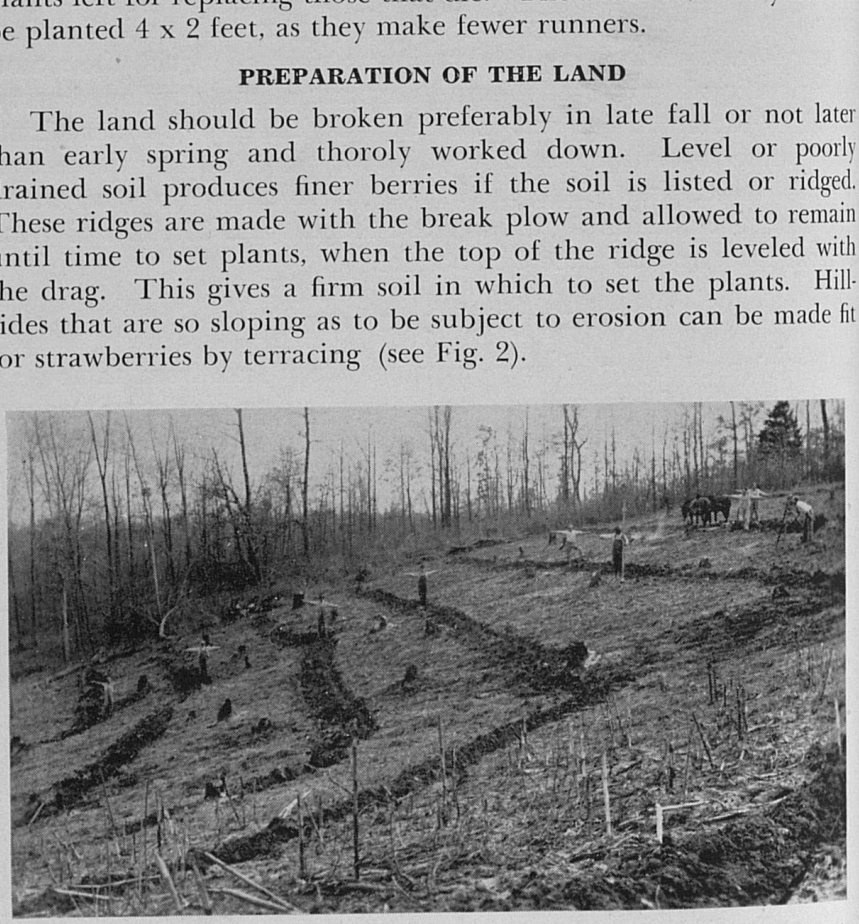

FIG. 2. TERRACING LAND FOR STRAWBERRIES. This new ground was planted to corn the first year, then terraced and planted to tobacco and followed with strawberries.

SETTING THE PLANTS

As the plants are unpacked or taken from the row where they have been heeled in, it is highly desirable to prune the roots. This can be done with scissors, removing one third of the lower roots; otherwise when setting the plant it is difficult to prevent curling or bending the roots. This practice also stimulates the development

of new roots. It is desirable to remove the large leaves in order to reduce the loss of water by transpiration.

The plants are ordinarily set by hand using a flat trowel, a spade or a tobacco peg. The tool is used to open a hole large enough to receive the roots spread fanshape, the plants being inserted to such a depth that the bud or crown is slightly above the ground level. The soil around the plant should be well firmed to eliminate all air pockets, otherwise the roots may dry out and the plants die. Care should be taken as with other plants to protect the roots against drying out as they are being distributed at planting time. The bloom stalks should be removed as soon as they appear, for the plants will begin to produce runners earlier if the blooms are removed.

CULTIVATION

One of the most important factors in determining the success or failure of a strawberry crop is cultivation. Work with the plow or harrow and hoe should begin soon after the plants are set, and continue at 10-day intervals until about the middle of August. When

FIG. 3. THE NEW BERRY FIELD IN AUGUST. Hoeing is necessary for successful growing of strawberries. Weeds are kept out during June, July and August. New runners are properly placed and the tips covered with soil to assist in developing a good matted row of new plants.

the soil is very dry it may be desirable to firm it by using a farm roller. Tools similar to those for cultivating tobacco may be used. Experienced growers find that eight cultivations and three hoeings are about the minimum. By having the plants set on the square, like dark tobacco, cultivation can be done in both directions during the first few weeks, thus saving considerable hoeing.

MULCHING

Mulching is a necessary part of commercial strawberry production for any district that plans to market berries successfully over a period of years. Any shipping point for truckload or carload lots of berries that has the reputation for packing dirty or sandy fruit

FIG. 4. MULCHED BERRY FIELD. A field of properly mulched Kentucky Aromas in April of the first picking year. One and one-half tons of wheat straw per acre was spread in early January. This keeps the berries free of dirt and sand, keeps down weeds and helps to retain a good supply of moisture at harvest time.

is discriminated against to such an extent that top prices are not offered. Even a few sandy berries on the top layers of a crate may decrease its sale value by one half.

The mulch may consist of wheat, oats or rye straw, shredded fodder, lespedeza hay, threshings, broom sedge, etc. Wheat straw is used more than any other material. Any mulch material should be free of seeds. Home-grown materials should be cut before seeds form. Baled straw usually contains some grain and weed seed. These can be destroyed by exposing the straw to the weather. One wire on each bale may be cut to loosen the straw so that rain can penetrate into the bale and cause the seed to germinate.

About 1½ tons of straw are needed per acre. The mulch should be applied in late December or in January. The matted rows of plants and the space between them should be covered a few inches deep. The mulch not only keeps the berries clean but helps to conserve moisture and keep down weeds which is often important at ripening time. It should be allowed to remain on the plants

until growth begins in the spring but should be partly raked off the rows into the middles to prevent smothering. It is desired that the plants should grow up thru a thin layer of mulch. If frost threatens late in the spring the straw between the rows may be pulled back over the row during the danger period.

Growing a Mulching Crop. Sudan grass and some of the millets planted thick are quite satisfactory for mulch. These crops should be planted in early summer so that they can be cut and cured in the fall before the seed forms. Korean and Kobe lespedeza cut before they come into bloom make a good mulch and will make from one to two tons per acre. The practice of sowing oats between the strawberry rows in early fall and allowing it to be killed down by frost, for mulch, is not recommended. The two crops compete for plant food and moisture during the fall and early winter, to the detriment of the berry plants.

PICKING, GRADING AND PACKING

Picking is the most important detail connected with strawberry production, yet it is often given little consideration. Altho all other details of production and marketing may be done properly, damage to the berries from careless picking may reduce the profit as much as 50 percent. All berries to be shipped should be in prime ripe condition. Those picked a day too soon have green tips and those picked a day too late will become soft in transit, thus both are culls. Berries may be damaged in picking by crushing, by pulling off the cap or by pulling out the core, leaving an open cavity that will mold and rot before reaching the market. To pick properly, the fruit stem should be grasped and bent with a quick motion causing it to break without bruising the berry. Most persons learn to do this in a short time, tho some seem to be unwilling to try and should not be employed for this work. Since strawberries are easily damaged it is imperative that they should be handled as little as possible. Grading the berries as they are picked is one of the best ways to reduce handling.

Six to eight pickers per acre, according to yield, usually are necessary. Assuming a grower has 3 acres of berries, he will need 18 to 24 pickers and 2 helpers in the packing shed. The grower can spend his time best supervising the picking gang and will not have time to pick berries himself. Usually the grower's wife or daughter, or some competent employee, has charge of the packing shed. Their work is to check the pickers in and out and keep records for the payroll. The following procedure will be found convenient. A plain cardboard the size of a sheet of writing paper may be provided. Each picker's name is recorded on this and each is

WEEKLY PICKING RECORD AND PAYROLL SHEET

Picker's name and number	Sun. Qts.	Mon. Qts.	Tues. Qts.	Wed. Qts.	Thurs. Qts.	Fri. Qts.	Sat. Qts.	Total Qts.	Crates
John Doe 15		6, 5, 6 6, 6, 6 6, 6, 5		6, 6, 6 6, 6, 6 4		6, 5, 6 6, 6, 6 5, 6, 6		144	6
Richard Roe 16									

given a number. Then each picker is given a picking tray (commonly called a "Handy," see Figure 5) which holds 6 quart berry boxes (usually called cups). Five of these are used for graded berries and one for culls. The picking supervisors then assign each picker to a certain row, with instructions to place the first handful of berries in one cup, the second in another cup, and so on, so that the five cups are filled gradually. This is to enable the field supervisor to examine the grading being done by each picker, without

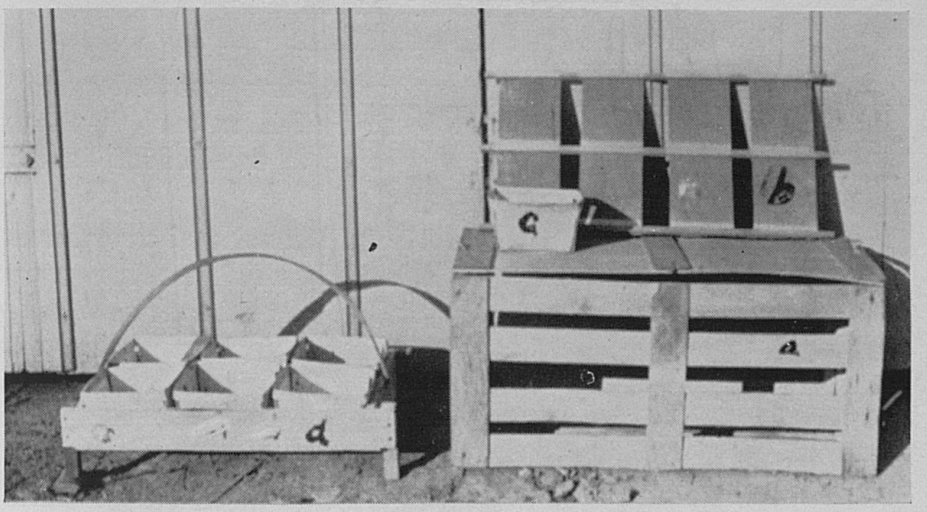

FIG. 5. CRATE, CUPS AND HANDY. (a) A standard 24-quart ventilated strawberry crate. (b) Divider. (c) Veneer quart basket, commonly called a "cup." (d) A homemade tray commonly called a "handy," used by the picker.

PICKING TICKETS (1 x 2 Inches)

1 CRATE Grower's name and address	1 QUART Grower's name and address
Blue cardboard	White cardboard
1 HANDY Grower's name and address	Pickers' Number ..... Grower's name and address
Red cardboard	White paper

handling the berries. When all the cups are filled the picker takes the handy to the packing shed where the shed supervisor makes a record on the cardboard sheets and, at the same time, gives the picker a ticket which shows the quantity delivered. The picker is given credit for the culls the same as for graded berries. A tag with the picker's number may be placed in the bottom of each cup. This serves to identify each picker's berries and makes a double check on the picker.

INSPECTION AND GRADES

Federal inspection at the loading station has not been used for Kentucky berries because the local marketing associations employ their own inspectors. Any new section of Kentucky that markets commercial berries may find it advisable to use Federal inspection at the loading point.

U. S. Standards. "U. S. No. 1" shall consist of strawberries of one variety, with the cap (calyx) attached, which are firm, not overripe, underripe, or undeveloped, and are free from mold or decay and from damage caused by dirt, moisture, foreign matter, disease, insects, or mechanical or other means. Unless otherwise specified, the minimum size shall be not less than three-quarters of an inch in diameter.

In order to allow for variations, other than size, incident to proper grading and handling, not more than 10 percent by volume, of the berries in any lot may be below the requirements of this grade, but not to exceed one half of this tolerance, or 5 percent, shall be allowed for defects causing serious damage, and not more than one-fifth of this amount, or one percent, shall be allowed for decay. Not more than 5 percent, by volume, of the berries in any lot, may be below the specified minimum size.

"U. S. No. 2" shall consist of strawberries which are free from decay and from serious damage caused by disease, insects, mechanical or other means. Unless otherwise specified the minimum size shall be not less than five-eighths of an inch in diameter.

In order to allow for variations other than size incident to proper grading and handling not more than a total of 10 percent, by volume, of the berries in any lot shall be allowed for defects causing serious damage but not to exceed three-tenths of this amount, or 3 percent, shall be allowed for berries affected by decay. Not more than 5 percent, by volume, of the berries in any lot may be below the specified minimum size.

"Unclassified" shall consist of strawberries which are not graded in conformity with either of the foregoing grades.

Definition of Terms. "Overripe" means dead ripe, becoming

soft, a condition unfit for shipment and necessitating immediate consumption.

"Underripe" means so immature that less than two-thirds of the surface of the berry is of a pink or red color.

"Undeveloped" means not having attained a normal shape and development owing to frost injury, lack of pollination, insect injury, or other causes. "Button berries" are the most common type of this condition.

"Damage" means any injury from the causes mentioned which materially affects the appearance, edibility or shipping quality.

"Serious damage" means that the strawberries are soft, badly deformed, badly bruised, leaky, or otherwise seriously injured. Strawberries which are caked with dirt or which show no pink or red color shall be considered seriously damaged.

"Diameter" means the greatest dimension at right angles to a straight line running from the stem to the apex.

CARE OF PATCH AFTER HARVEST

Experienced strawberry growers of Kentucky differ widely in opinion as to the best method of handling the field after the first harvest. Many successful growers spend no money or labor in working out the old field, but simply allow it to remain, cut it over twice with the mower in June and October, and pick the crop the following spring. If June, July and August are dry, the yield the following year may be greater than it would have been if the field had been worked out. Where this method is followed, it is not necessary to apply a mulch.

The small grower usually plans to mow and work out his patch immediately after harvest. There are a number of ways in which renovation may be done, all with the same final result. A common method is to use the break plow to turn one or two furrows from each side of the row, leaving a narrow row about 8 inches wide. The space between the rows should be cultivated immediately, smoothing down the ridges and working fresh soil around the narrow rows of young plants. The field may be harrowed crosswise with a spike harrow to level the soil and thin out surplus plants. Usually, it will be profitable to sidedress the narrow row of plants with a complete fertilizer (a 4-12-4, for example) applying 300 to 400 pounds per acre. Cultivation and hoeing should be done thru June, July and August as in the first growing season.

SUGGESTIONS TO LANDLORD AND TENANTS

The following figures are averages over a 15-year period; they are not assumed to be exactly correct under all conditions but are

given as a reasonable basis from which landlord and tenant can work out an agreement satisfactory to both:

Estimates for 1 Acre, at an Average Yield of 80 Crates

COST TO LANDLORD		COST TO TENANT	
Rent value of good land	$ 5.00	Horse labor, 60 hrs. at 10 cts	$ 6.00
4000 plants at $3.00	12.00	Man labor, 140 hrs. at 15 cts.	21.00
400 lbs. superphosphate	5.00		
Straw for mulch	5.00		
	$27.00		$27.00

Marketing costs to be divided equally or to be taken from Association check.

Picking, grading and packing, per crate	$ 0.60
Trucking to R. R. depot	0.08
Crates, with cups and divider	0.30
Association costs, including commission, bookkeeping, labor, lumber, re-icing	0.27
	$ 1.25

The cost of trucking berries to the loading station will vary from 3 cents to 15 cents per crate, according to distance and volume.

With $3.00 per crate as an average gross selling price received during the past 15 years, a yield of 80 crates per acre and marketing cost of $1.25 per crate would leave $1.75 return per crate, or $140 per acre, to be divided equally between landlord and tenant. After deducting the $27.00 per acre, as estimated above, the landlord and tenant would each have a net return of $43 per acre.

Assuming that the same acre was kept for picking the following year, and that no labor was spent in working out the one-year-old patch, a reasonable yield to expect would be about 50 crates per acre. On this basis the net profit the second picking year would be similar to that of the first year.

Cultivation is an important factor in successful berry production, especially hoeing at critical times. In case the tenant should be busy with other crops at critical times, and neglect the berry field, it is advisable for the landlord to have at least a verbal agreement with the tenant, before starting a planting of strawberries, whereby the landlord reserves the privilege of hiring labor to cultivate and hoe the berry field, if neglected, this expense to be deducted from the tenant's half of the marketing association check. This labor agreement will, in most cases, be a profitable provision for both the landlord and tenant.

YIELD, COSTS AND PROFIT

According to the United States census, the average yield of strawberries in Kentucky is only about 50 crates, or 1200 quarts, per acre. This is far below what may be expected. Many growers

average 150 crates per acre and some, more than 300 crates per acre. The cost of growing an acre of berries varies widely with different growers. The general estimate given above shows an expenditure of $54 per acre for production costs up to the picking season. The gross selling price received by one marketing association in Kentucky, from 1917 to 1936, inclusive, ranged from $1.20 to $5.56 per 24-quart crate, with an average of $3.34 for the 20 years. After deducting the production cost of $54 per acre and harvesting cost of $1.25 per crate, a crop which averaged 50 crates per acre would net $50.50 per acre; one which averaged 100 crates, $155.00, and one which averaged 150 crates, $259.50 per acre.

INSECTS AND DISEASES*

The Crown Borer. The adult insect is a reddish-brown snout beetle about 1/8 inch long, which hibernates in or near the strawberry patch, in the soil or under litter. Most of the injury is done by the thick-bodied grub which is about 1/5 inch long when full grown. Figures 6 and 7 show the life cycle. In March or April eggs are laid on the plants or on the surface of the ground near them. Egg laying may continue thru May and early June. Upon hatching, the grub feeds in the crown of the strawberry plant and burrows downward until, by maturity, it may have eaten out a large part of the contents. The plant is so weakened that it either dies or produces little runner growth. If several grubs are in one crown, only the shell is left. The grubs change to beetles about midsummer and these hibernate when winter approaches. There is one brood a year. The borer feeds on strawberry plants and on the common wild cinquefoil, or fivefinger. No other host plant is known.

The crown borer is present in many strawberry beds in the state, and seems to be increasing rapidly. Serious outbreaks have occurred in southwestern Kentucky and less serious ones in Jefferson, Ohio and Warren counties. The menace from crown borer increases with the age of the patch. A slight infestation the first year may increase greatly the second or third year and completely destroy the field. Few growers realize how destructive the crown borer may be until they have lost a field from its inroads. In other states, entire areas have been temporarily eliminated before a sufficient number of local growers would cooperate to destroy the insect in their locality.

Control. Control measures are simple and not expensive. A

* The material on insect control was prepared in cooperation with the Entomologists of the Kentucky Experiment Station; the paragraph on strawberry leaf spot, in cooperation with W. D. Valleau, Plant Pathologist.

planting can be kept free from the borer by using the following precautions:

Set only clean, certified plants or young plants from runners of the preceding year.

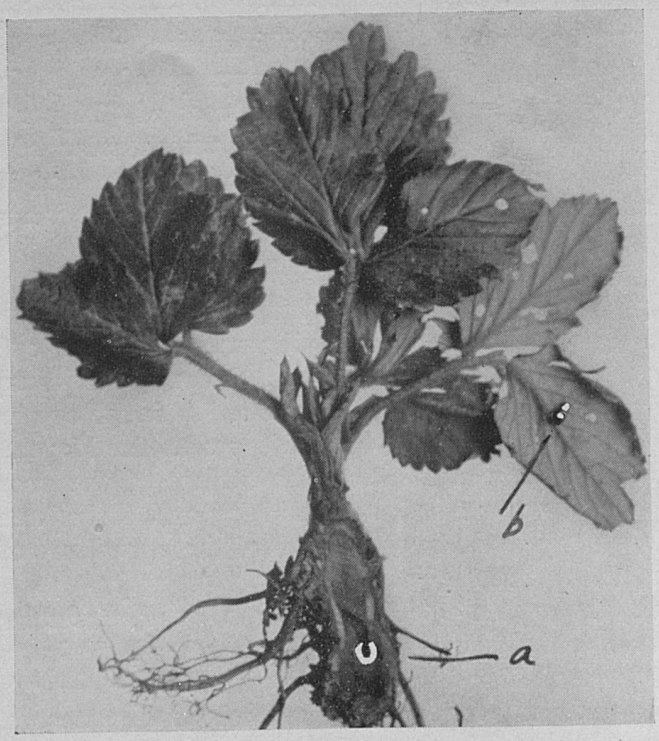

FIG. 6. STRAWBERRY CROWN BORER. (Courtesy Dept. of Entomology and Botany.) The most destructive insect to strawberries. The small, white grub can be seen feeding in the crown of the plant. Few or no runners develop from such plants and the plant itself dies in August. (a) Larva feeding in crown of plant. (b) Adult beetle feeding on leaf.

Start the new field not nearer than 300 yards to old plantings or to patches of wild plants.

Use land that has been cultivated for the past year or two.

Dig plants between November 15 and March 1. Wash all soil from the roots, in running water, to remove hibernating beetles. Heel these plants in some distance from the old planting and leave them until conditions are favorable for planting, in early spring.

Destroy old plantings by burning and plowing, as soon as the crop has been harvested.

White Grub. This is the immature or larval stage of the June-bug or May beetle (Fig. 8.) There are several species in Kentucky. This grub lives and feeds in the ground for one to three years. It attacks the roots and crowns of the plants. If the land has been in

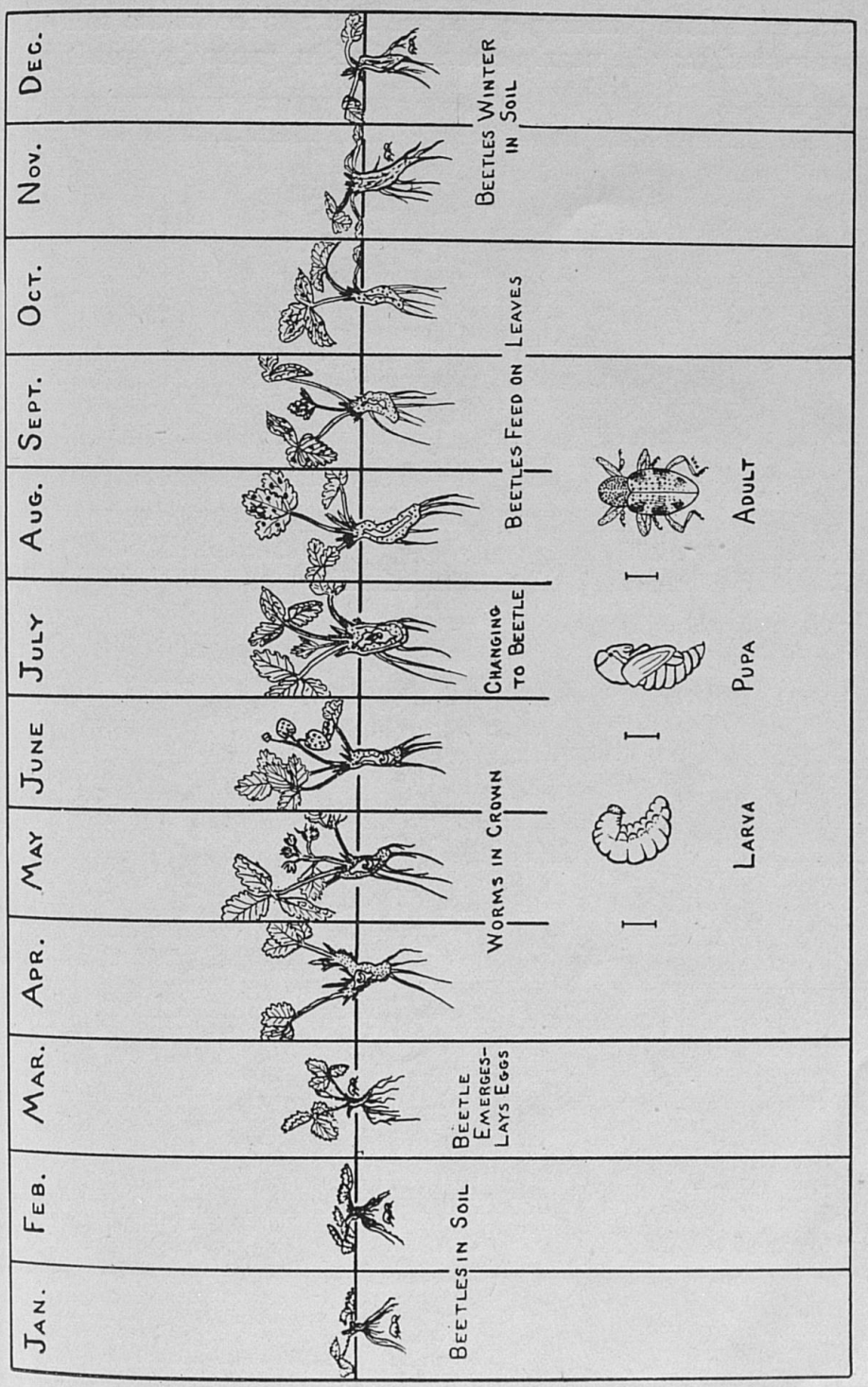

FIG. 7. LIFE CYCLE OF THE STRAWBERRY BORER BY MONTHS. (Courtesy Dept. of Entomology and Botany.) The beetles emerge from the soil in March and lay eggs in the crown of the plant. Eggs hatch in April or early May and the young larvae feed on the crowns during May, June, July and August. They change to adult beetles in fall and pass the winter in the ground near the berry plant. Control by digging plants before the eggs are deposited in March.

sod just before planting, grubs are likely to be in the soil. Strawberry land may be nearly cleared of white grubs by growing either

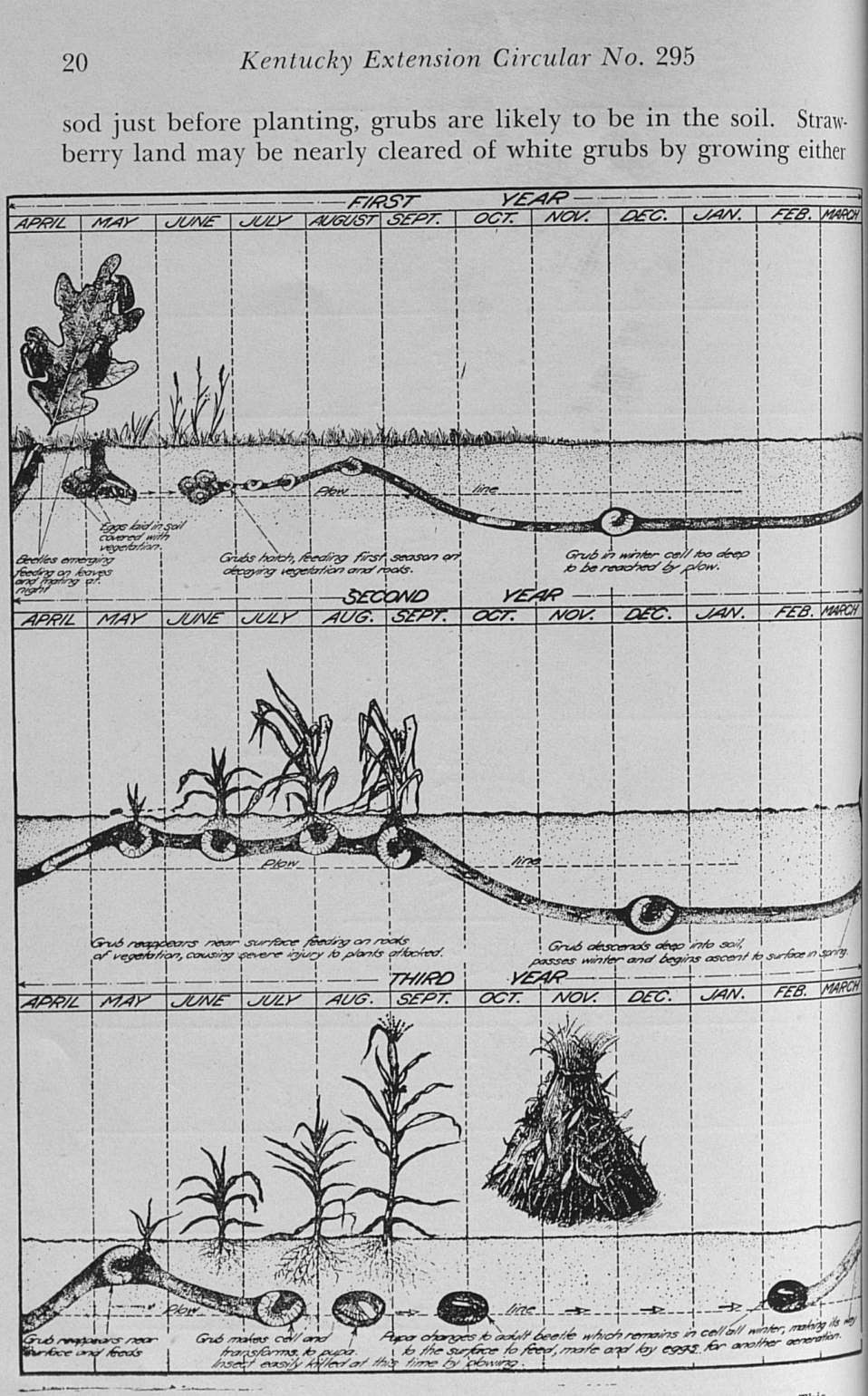

FIG. 8 3-YEAR CYCLE OF WHITE GRUB. (Courtesy, U. S. D. A.) This insect causes large losses each year to Kentucky strawberry growers.

a cultivated crop or a green-manure crop on it for at least two years before planting strawberries.

Leaf-Roller. This insect is of minor importance as compared with crown borers and white grub. It is a small, greenish-brown caterpillar with a brown head. It is very active when disturbed. It rolls one portion of the leaf over upon the other and feeds within the protecting fold. An outbreak of this pest in Fleming County, in 1934, destroyed entire fields.

Control. Spray with lead arsenate, 3 pounds to 50 gallons of water just before blossom time, before the insect has caused the leaves to fold.

Cutworms. Newly set berry plants may be cut off at or below the surface of the ground, in early spring, by cutworms. Occasionally bearing fields are attacked. These insects are smooth, green caterpillars about an inch long. They hide just below the surface of the ground during the day and forage at night. They can be successfully and economically poisoned with bran bait prepared by stirring 2 quarts of cheap molasses, such as sorghum or black strap, into 3 gallons of water and mixing this thoroly with one pound of paris green and 25 pounds of bran. Mix the bran thoroly with the water and molasses until all particules have been moistened. If the mash is sloppy, add more bran until it is just thick enough to hold together when squeezed in the hand. The bait is then scattered evenly over the berry patch just at dusk. Fifteen pounds of the mixture are sufficient for an acre.

Leafspot. Leafspot is the most common strawberry disease. It first appears as a small, white area with a purplish border, on the leaf. Later, the whole leaf may be affected, turning red or purplish and later having a scorched appearance. The Aroma and Premier varieties are nearly immune to this disease. It is quite common on the Blakemore variety and especially severe on the Gandy variety. Control consists in spraying with a 3-6-50 (3 pounds bluestone, 6 pounds hydrated lime and 50 gallons of water) bordeaux mixture when growth begins and again just as the blossoms appear.

SUMMARY

Kentucky grows 6,000 to 10,000 acres of commercial strawberries annually. The berries are shipped by refrigerator express and trucks to many northern and eastern markets, including Canada.

Marketing thru cooperative associations has been found to be the most satisfactory plan.

The dread of picking is the outstanding obstacle confronting

the prospective grower. This can be overcome by depending on hired help to do the picking.

Any good tobacco land will produce strawberries. Soil building with green manure and superphosphate is advisable.

Preparation of the land in late fall is desirable.

The Aroma variety leads in Kentucky. Blakemore and Premier also are important. Everbearing varieties have not proved successful.

Strawberry plants should be set in March or early April. Early runner plants are many times as productive as those formed in late August and September.

When plants are received they should be unpacked and heeled in as soon as they arrive.

The roots should be pruned before the plants are set, and the soil should be firmed around them, in setting. Blooms should be picked from the newly set plant as soon as they appear.

Frequent cultivation and hoeing the first year are essential.

Mulching is necessary to keep the fruit clean and conserve soil moisture.

Grading berries by the pickers is the most economical plan and is used by a majority of Kentucky growers.

A definite contract should be made between tenant and owner.

Yields of 100, 24-quart crates per acre can be expected. A production cost of $54 per acre up to the beginning of harvest, and $1.25 per crate for picking, grading, packing container and marketing expense are fair estimates. The gross selling price received by one Kentucky association in the past 20 years averaged $3.34 per crate.

The crown borer is the most destructive strawberry insect in Kentucky. After a field becomes infested there is no control measure. Infestation can be prevented by setting clean plants some distance from old plantings.

Grub worms can be prevented by using land that has been cultivated two years before strawberries are set.